

## Research Items.

**PRE-HISPANIC JEWELRY IN COLOMBIA.**—Among the contributions to the session at The Hague of the thirty-first International Congress of Americanists which have recently been published is a description by Dr. Paul Rivet of two collections of pre-hispanic jewelry in gold and gold and copper—one of Chibcha manufacture, the other Antioquian. Although they represent two entirely distinct industries, they have a common technique which is identical on general lines and is also related to the technique of the gold ware of Chiriqui, Panama. The Colombian gold industry was carried by the Chibcha far beyond the bounds of Colombia, and the whole of Ecuador and the Peruvian coastal areas appear to have come under its influence. In the same region an entirely different industry, originating on the Peruvian-Bolivian plateau, has been superimposed. Unlike the Chibcha industry, which is confined to gold and gold-copper, this superimposed industry works in copper, gold, tin, silver, exceptionally lead, and the alloys of these metals. The Chibcha industry, notwithstanding its high development, is probably not indigenous. It may be derived from the industry in an alloy of copper and gold, which the Spaniards found on their arrival among the inhabitants of the Antilles and the area north of the Amazon-Venezuela and the Guianas. This alloy is identical with that of Colombia, and the industry may have been introduced into that area by a Carib invasion. The centre of its origin lay possibly in the hinterland of the Guianas, the legendary site of El Dorado, and may have given rise to that tradition. The antiquity of the Carib invasion must be considerable, as the Chibcha technique appears on the Peruvian coast so early as the proto-Chimu period of Uhle.

**VITAL STATISTICS OF SOUTHERN INDIA.**—A study of the vital statistics of southern India, by Major A. J. H. Russell, which appears in the *Scientific Monthly* for July, brings out some interesting points bearing upon the question of the conservation and promotion of the population. Of a population of 41,002,696 (1921), the Hindus form 89.48 per cent., Mohammedans 6.95 per cent., and native Christians 3.27 per cent.; other classes 0.04 per cent. A study of the population curve since the census was initiated in 1871, shows that southern India has very nearly reached an asymptotic population under present conditions. Indeed it has been necessary to import food stuffs during the last few years and, in spite of serious famine years and epidemics, the population is still too large for the methods of cultivation employed. The registered birth-rate is 30.0 per 1000, but there is reason to believe that the birth-rate is really so high as 42.5 per 1000. In Madras City, where registration is more accurate, in 1922 it was so high as 41.2, and of 215 towns, 13 registered a rate of 40 to 50. The registered death-rate for the same period was only 21 per 1000, but actually it was probably 33 to 36 per 1000. In Madras City it was 43.1 per 1000. Infantile mortality was very high, although there has been a distinct downward tendency. In several of the largest towns this was so high as 311.6 to 352.8 per 1000, as against the English rate of 80 per 1000. Nearly 50 per cent. occur within the first month. This is attributed largely to the Hindu employment of 'barber' midwives, and it is significant that in the towns, 13.7 mothers die for 1000 births, the rate for the whole presidency probably being much higher.

**ROGER BACON AND GUNPOWDER.**—In a recent issue of *Archivio di storia della scienza* (vol. 7, 1926,

p. 34), Adolf Clément of Copenhagen offers a new and convincing solution of the famous cipher in Bacon's "Epistola de secretis operibus artis et naturae et de nullitate magiae." The passage in question, which it is only right to say has been regarded as of doubtful authenticity, reads: "Item pondus totum 30. Sed tamen salis petrae LURU VOPO VIR CAN UTRJET sulphuris; et sic facies tonitruum et coruscationem, si scias artificium." Lieut.-Colonel H. W. L. Hime interpreted the words in cipher by omitting *et* and rearranging the remaining letters into R. VII. PART. V. NOV. CORUL. V., which he translated "take seven parts (of saltpetre), 5 of young hazelwood (charcoal) and 5 (of sulphur)." Hime's solution (for a detailed account of which see "Roger Bacon Memorial Essays," Oxford, 1914, chap. xii.) has, however, been severely criticised by Lynn Thorndike, and is far less convincing than Clément's. Clément points out that the letters of the words in cipher can be rearranged into "pulveris carvonu tritov," the letters *s*, *m*, and a syllable *rum* at the end of *tritov* instead of *v*, apparently being lacking. It must, however, be remembered, he says, that the cipher was written at an epoch when abbreviations were in common use, and the three final letters of the words as rearranged are really signs of abbreviation, namely, *i* for *z*, i.e. *is*; *v* for *ū*, signifying *um*; and *v*, in *tritov*, for *z*, i.e. *rum*. The sentence would then read: Sed tamen salis petrae, pulveris carvonum tritovum, sulphuris, etc.

**ARABIC ASTRONOMY.**—In a recent number of the *Sitzungsberichte der physikalisch-medizinischen Societät zu Erlangen* (Band 58, 1926, pp. 33-88) O. Schirmer continues the Erlangen tradition of the study of Islamic science. Inspired by Prof. Wiedemann, Schirmer has investigated some problems of Arabic astronomy, the most interesting being concerned with Arabic determinations of the inclination of the ecliptic. Two pages of figures of these determinations are given, chiefly, as might be expected, for Bagdad, Damascus, etc., though one was made at Toledo by Al-Zarqali. Al-Chugendi's description of his determination at Ray (near Teheran) in 994, for which he obtained the figures 23° 32' 21", is very clear. Prof. Wiedemann provides an appendix in which he translates the introduction of an astronomical work by Al-Nasawi; this contains a good deal of noteworthy historical information referring, *inter alia*, to the Aristotle of Islam, Avicenna.

**TABULA SMARAGDINA.**—Prof. Julius Ruska, of Heidelberg, whose work on the history of chemistry in Islam is well known, has recently published an exhaustive study of the "Emerald Table" of Hermes ("Tabula Smaragdina," Carl Winter's Universitätsbuchhandlung, 1926). He deals first with the ancient Hermetic literature, and discusses the conception of the god Thoth among the Egyptians. Passing in review Scott's "Hermetica," he rightly remarks that in sweeping aside all the alchemical books ascribed to Hermes as masses of rubbish, Scott was acting in a high-handed fashion, since "weder der Inhalt noch die Geschichte des ganzen Literaturkomplexes, der unter des Hermes Trismegistos Namen geht, gibt uns ein Recht auf solche grundsätzliche Scheidung und ungleiche Bewertung." A detailed study follows of Hermes and Hermetic literature among the Syrians, Arabs, and Persians, and Prof. Ruska shows that the attribution of the "Tabula" to Greek sources is probably not justified. He gives the Arabic text as found in a work of Jābir ibn Hayyān, and also as it occurs in a collectaneous

MS. in a private library in Germany. He does not give credence to Jâbir's statement that he found the text of the "Table" in a work of Apollonius of Tyana, remarking that all we can be sure of is that by Jâbir's time (eighth century A.D.) a magical, astrological, and alchemical literature ascribed to Apollonius had grown up, but how much of it was genuine, or even from Greek sources at all, it is impossible to say. Prof. Ruska then deals with the "Emerald Table" in its Latin dress, exhibiting a wide and deep knowledge of medieval alchemical literature, but remaining interesting in spite of erudition—or perhaps because of it. The commentary of that enigmatical person Hortulanus is considered, and references to the "Tabula" and other Hermetic writings in Albertus Magnus, Arnold de Villanova, Trithemius, Paracelsus, and others are described. With one or two exceptions, such as the omission of any mention of the work on the "Table" published by Steele and Fulton, the book is extraordinarily complete, and contains everything that is of importance on the subject with which it deals.

**HERRING AND PLANKTON.**—The correlation of abundant plankton food with large catches of herring, if it can be successfully proved, should point to a means of great value for enabling fishermen to shoot their nets in areas most likely to be profitable, when the herring are actively feeding. In this connexion, Mr. R. E. Savage ("The Plankton of a Herring Ground." Min. Agric. Fish. Fishery Invest. Series 2, Vol. 9, No. 1, 1926) records the results of a cruise of the fisheries research vessel to study the plankton in the North Sea, in July 1922, off the mouth of the Tyne, where the herring fishery was very poor at the time. The catches of plankton on the fishing grounds, which consisted mainly of copepods, chiefly *Temora longicornis*, are stated to have been poor; while the region in which the plankton was most abundant did not coincide with the centre of the area in which the herring boats were fishing, but was some 20 miles south-east of it. Interesting observations are given on the vertical distribution of the different plankton organisms, together with a comparison of the distributions shown by day and by night collecting. It was found, by a series of hauls at each 5 fathom depth, that the deeper layers were generally richer in plankton animals as a whole in the daytime, and that the poverty of the surface layers extended to a depth of at least 10 fathoms.

**VERTEBRATE DEVELOPMENT.**—Volume 17 of the Carnegie Institution's Contributions to Embryology contains a paper on the origin of the rete ovarii and rete testis by Dr. K. M. Wilson, a description of the vessels of the sow's ovary by Miss D. H. Anderson, a physiological study of cortical motor areas in kittens and adult cats by Messrs. L. H. Weed and O. R. Langworthy, and a paper on the relations between the onset of decerebrate rigidity and the time of myelination of tracts in the brain and spinal cord of young animals by Dr. Langworthy. Dr. Wilson's most important conclusion is that the rete cords arise from deeply lying undifferentiated cells in the early sex gland and so indirectly from the coelomic epithelium; thus they do not have a Wolfian origin. Miss Anderson's paper deals with the cyclic changes in the blood-vessels and lymphatics of the ovaries, and shows that both of these form double wreaths around the follicle, the capillaries growing inwards at ovulation and the lymphatics following two days later when the corpus luteum is becoming organised. Messrs. Weed and Langworthy determined the re-

sponses to electrical stimulation of the cerebral cortex in cats of all ages from birth, and found that in the newly-born ones movements of the contralateral fore-leg only were obtained, but in older ones not only these but also movements of the hind leg and of the facial-masticatory muscles were observed. The areas made out for the young kitten corresponded topographically to the same areas in the adult. In the paper by Dr. Langworthy, strong experimental evidence is presented of a correlation between the myelinization of the rubro-spinal tract and the occurrence of decerebrate rigidity. All the memoirs are illustrated by plates.

**A DINOCEPHALIAN FROM SOUTH AFRICA.**—Prof. W. K. Gregory has published in the *Bulletin of the American Museum of Natural History* (Vol. 61, article 3) a very detailed account, illustrated by 21 plates and 29 text figures, of *Moschops capensis*, a dinocephalian reptile. This study is based on very complete material, some seven or eight skeletons being represented, and, as a result, Prof. Gregory is able not only to describe the osteology but also to discuss the relations of this animal, its probable food and habits, and to make a restoration of it as it appeared when alive. *Moschops*, a semi-aquatic animal, had advanced from the primitive reptilian condition in that its body was raised well off the ground. In the author's opinion it was derived from some Pelycosaurian ancestor.

**JAPANESE EXTINCT MAMMALS.**—Prof. Matsumoto describes in *Science Reports of the Tôhoku Imperial University*, Vol. 10, No. 1, various extinct mammals discovered in Japan, many of them being described for the first time. The paper is in three sections, the first dealing with Proboscidea. The chief interest of this account is the description of a new species of the genus *Hemimastodon*. This genus was first described by Dr. Pilgrim from Baluchistan from rather scanty material, and its existence was doubted by some authorities. Matsumoto's further evidence goes to support Pilgrim's determination of the genus as being a connecting link between the genus *Phiomia* (*Palaeomastodon* in part) and the later mastodons. Altogether fourteen species of Proboscidea are listed as occurring in Japan. The second section describes two pinnipeds, one an extinct form *Eumetopias watasei*, the other a specimen of *Odobenus obesus*, the walrus, possibly of Pleistocene age. The third section deals with four new species of fossil cetaceans.

**HYDROGRAPHY OF THE IRISH SEA.**—An account of hydrographic observations made in the Irish Sea between Holyhead and Dublin, by Mr. R. J. Daniel in 1925, is published in the annual report of the Lancashire Sea-Fisheries Laboratory (Liverpool University Press). In this area the water is of practically the same temperature and salinity from surface to bottom, which greatly facilitates the survey of these two physical conditions which are being carried out regularly every month. A slow drift of ocean water passing north through the Irish Channel, strongest in some months and weakest in others, has been known for some time, our knowledge being based on inferences drawn from changes in salinity of the water. Mr. Daniel's observations at regular intervals of one month may be expected to give a record of the fluctuations in this drift of water from year to year. A point of interest, recorded in this report, is the considerable differences in surface salinity readings at near-by stations which occur sometimes, and the small differences, at each station, between the surface and deeper samples.

**BOTTOM CURRENTS IN THE NORTH SEA.**—Under the title "The Water Movements in the Southern North Sea, Part 2, The Bottom Currents," Mr. J. N. Carruthers publishes an account of an extensive experiment conducted by the Ministry of Agriculture and Fisheries, by means of 'bottom trailers,' of which some ten thousand were set free from a number of selected positions throughout a year (Fishery Investigations Series 2, Vol. 9, No. 3, London: H.M. Stationery Office, 1926). This ingenious method of observing the drift of the water close to the bottom, by means of bottles so weighted that they remain lightly poised upon their tails of wire, which are about two feet long, was devised by Dr. G. P. Bidder more than twenty years ago, and has been used successfully in several areas of the sea around the coast of Britain. The bottles trip along lightly with any horizontal movement of the water and escape the danger of becoming arrested by mud and rough ground to a much greater extent than any body resting directly on the bottom, until such time as they are caught in the trawl of a fishing vessel or go ashore on the coast. The number of days each has been out and the distance travelled gives an indication of the currents experienced in the course of its wanderings. An idea of the intensity of the trawl fishing in the southern part of the North Sea is given by the fact that 24 per cent of the trailers put out were recaptured by trawlers. Besides these a number were found on the coast, particularly in the case of those liberated from the Sandettie, Galloper and Outer Dowsing Light vessels, from the positions of which there is an onshore set of the deep water. The results of this extensive experiment show that current of bottom water flows in to the North Sea from the English Channel, spreads out fan-wise towards the East Anglia and Dutch shores and proceeds north-easterly. A current also flows south-east off the coast of Scotland and north-east England until it reaches the latitude of Flamborough Head, when it turns easterly and finally north-easterly, forming a counter clockwise swirl system in the vicinity of the South Dogger Light vessel. Water from the two currents mingle and proceed north towards the Danish coast. The speed of the residual drift or current at each of the chosen positions approximates to a mile a day.

**A CURRENT METER FOR DEEP WATER.**—Much ingenuity has been exercised in the design of meters for measuring currents in the sea during recent years, and considerable headway has been made with a difficult practical problem. The apparatus devised by Prof. V. W. Ekman more than twenty years ago has been used extensively and is probably the best known type. In *Publication de Circonstance* No. 91 (June 1926) of the Conseil International pour l'Exploration de la Mer, he describes "a new repeating current meter" which is a development of the original model for use in deep water. The aim has been to provide an instrument to be used in several hundred fathoms from a vessel riding to a single anchor, which does not provide a fixed point of suspension for the meter owing to the veering of the ship. With this instrument a number of 'messenger weights' are slid down the wire to which the meter is attached, one after another at noted times, and the meter registers the direction of the current at the moment when each 'messenger' hits it, together with the distance the current has travelled between successive hits.

**THE COMPRESSIBILITY OF ROCKS.**—To test the rival hypotheses that beneath the earth's outer shell

the material consists of peridotite or basaltic glass, L. H. Adams and R. E. Gibson, of the Geophysical Laboratory of Washington, have made direct measurements of the compressibilities of dunite and tachylyte (*Proc. Nat. Acad. Sci.*, May 1926). The results show that at a pressure of 17,000 megabars, corresponding to a depth of 60 km., the velocity of longitudinal earthquake waves in dunite would be 8.4 km. per sec. In basaltic glass the corresponding velocity would be 6.45 km. per sec., and in gabbro from 6.9 km. to 7.3 km. per sec. The actual velocity of such waves at a depth of 60 km. is about 8 km. per sec. It is concluded that this gives a very definite indication "that at depths greater than 60 km. we have a material more basic than gabbro and approaching dunite in composition." The new measurements show quite conclusively that Daly's conception of a substratum of basaltic glass meets with no support, but neither can the author's deduction be completely justified. Eclogite would probably satisfy the evidence equally as well as peridotite. It is to be hoped that similar work on this high-pressure facies of basalt may soon be carried out.

**RADIATION WITHOUT QUANTA.**—The Montreal *Mercury* has issued as a pamphlet of 28 pages the two addresses given in April by Prof. L. V. King to the Physical Society of McGill University on the properties of a rotating electron in translatory motion. If the shortening of the axis of the electron in the direction of translation is taken into account, the equations of motion of the electron are shown to give a precessional motion of frequency  $\nu$  which is connected with the translational velocity  $v$  by an equation of the form  $h\nu = \frac{1}{2}mv^2$ , where  $m$  is the mass of the electron when at rest and  $h$  is a constant for all electrons. Thus the quantity  $h$  of the quantum theory is introduced by classical dynamics as a property of the rotating electron. The extension of the idea to spinning protons and to atoms leads to the series formulæ for the hydrogen and helium spectra and to the *S*, *P*, *D*, and *F* series for other elements with the correct value for the Rydberg constant. The fine structure of lines, the Zeeman and Stark effects are explained as due to perturbations of orbits brought about by external fields. The radiation formula in terms of temperature and wave-length follow from a Maxwellian distribution of electron velocities.

**COAL CARBONISATION TESTS.**—The Department of Scientific and Industrial Research has issued a Fuel Research Technical Paper, No. 15, on the Carbonisation of Durham 'Holmside' Coal in Continuous Vertical Retorts (London, H.M. Stationery Office, 1926). The continuous vertical retort has gained its popularity largely because it lends itself to the production of the lower-grade gas which is usually distributed to-day. The tests recorded were made at the Fuel Research Station, Greenwich, at the request of the South Metropolitan Gas Company, which distributes a coal gas of calorific value somewhat greater than is customary in England, and it is of considerable interest to ascertain how far the continuous vertical retort can be applied to the production, from a typical Durham coal, of gas of the quality used in South London. It was found that the settings required certain modifications both in construction and operation, after which it was possible to produce the carbonisation results desired. The tests were extended to study the effect of steaming the charge, so as to obtain results comparable with those previously obtained on other coals.